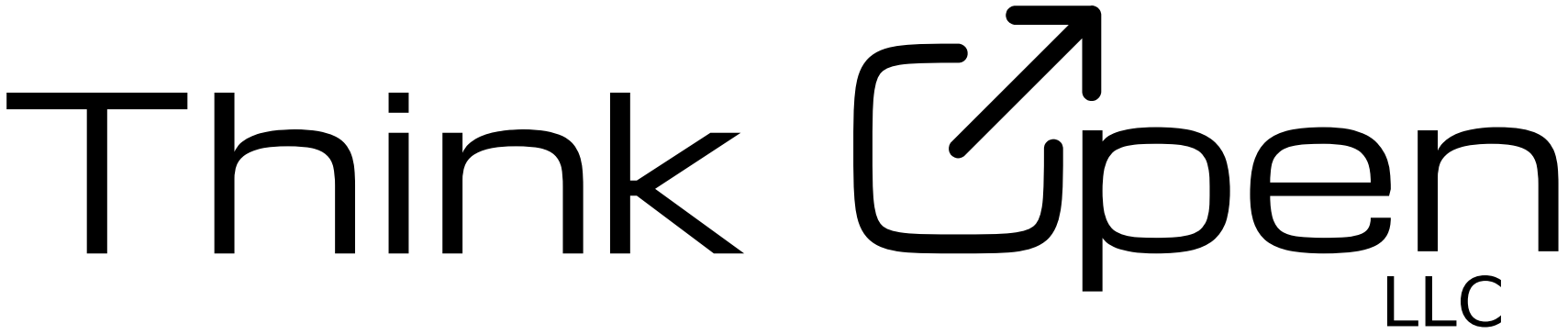
Engineering, Open Sourced

The future of engineering software

Joel Graff, P.E.

About Me

- B.S. Civil Engineering, Iowa State (1999)
- Licensed Professional Engineer in Illinois (2006)
- Husband, father of two sons
- Founded ThinkOpen, LLC in 2018
- Working to provide access to technology to the Sauk Valley community



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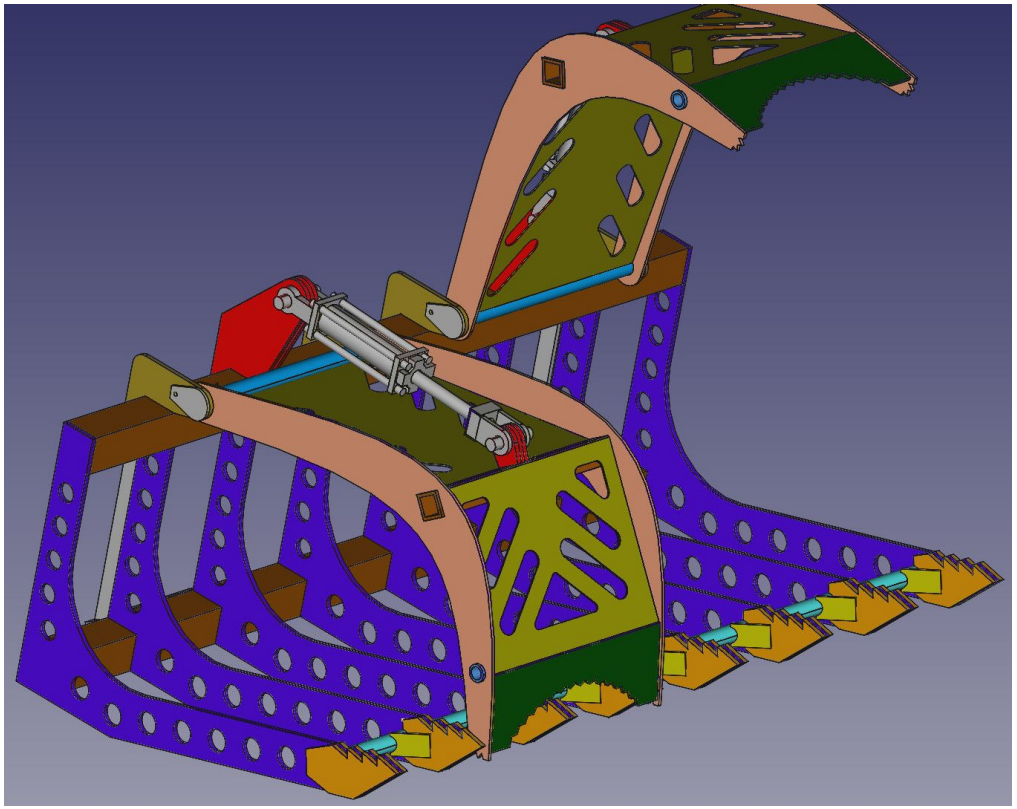
FreeCAD

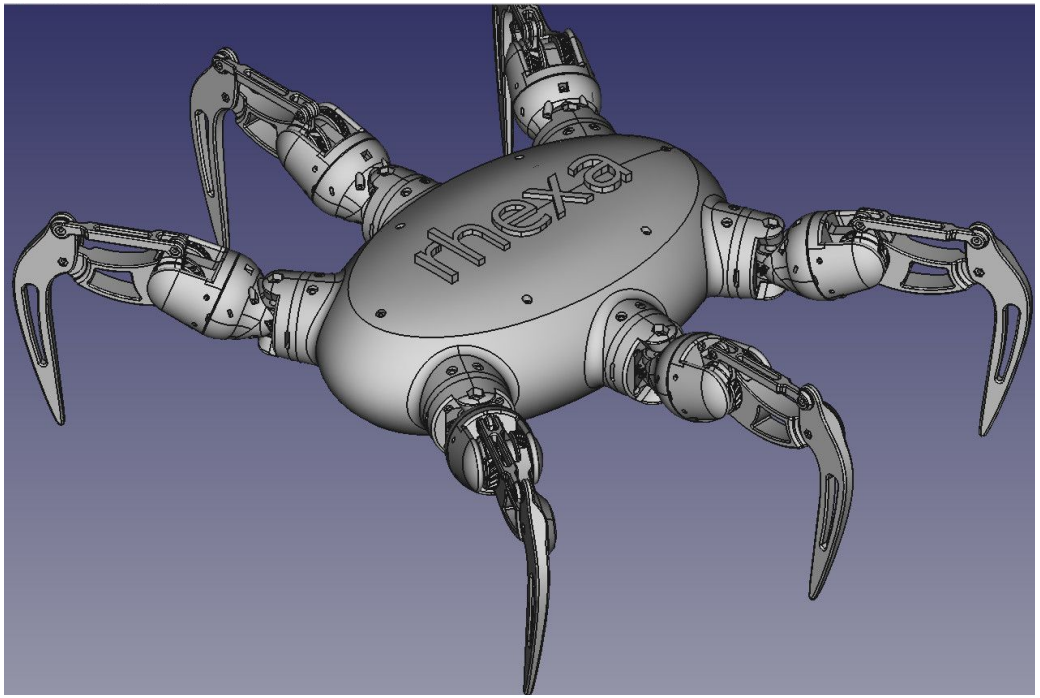
- OpenCASCADE kernel
- Fully parametric
- Modular workbenches
- 3D data formats
- CNC / g-code
- 2D sheet support
- 3D Rendering
- Integrated spreadsheet



https://www.freecadweb.org/wiki/Screenshots

Status

- Latest release 0.17
- 0.18 by February 2019
- Py3 / QT5
- ~50,000 lines added
- New website!



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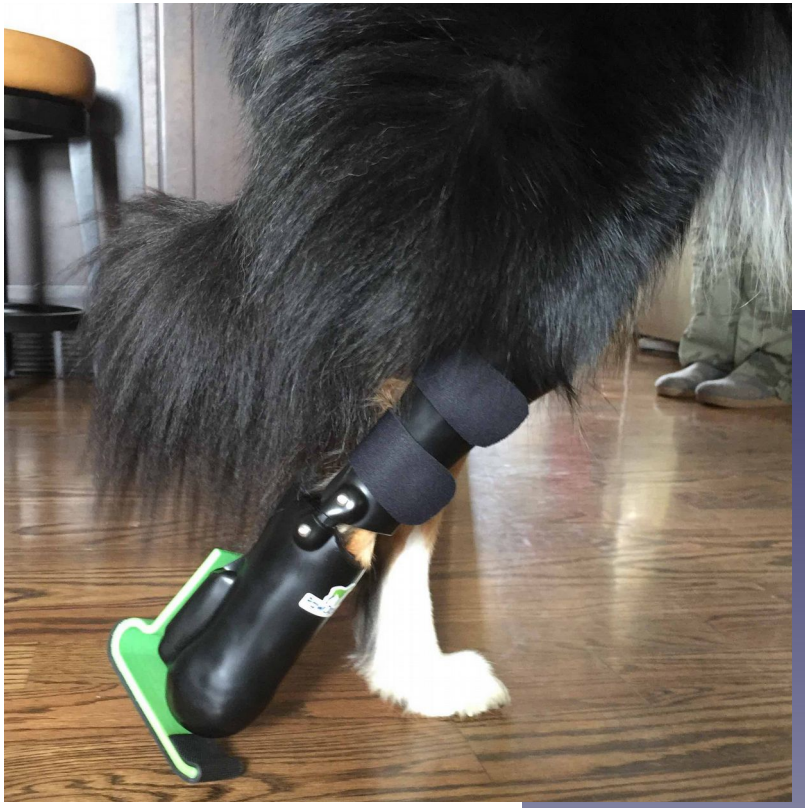
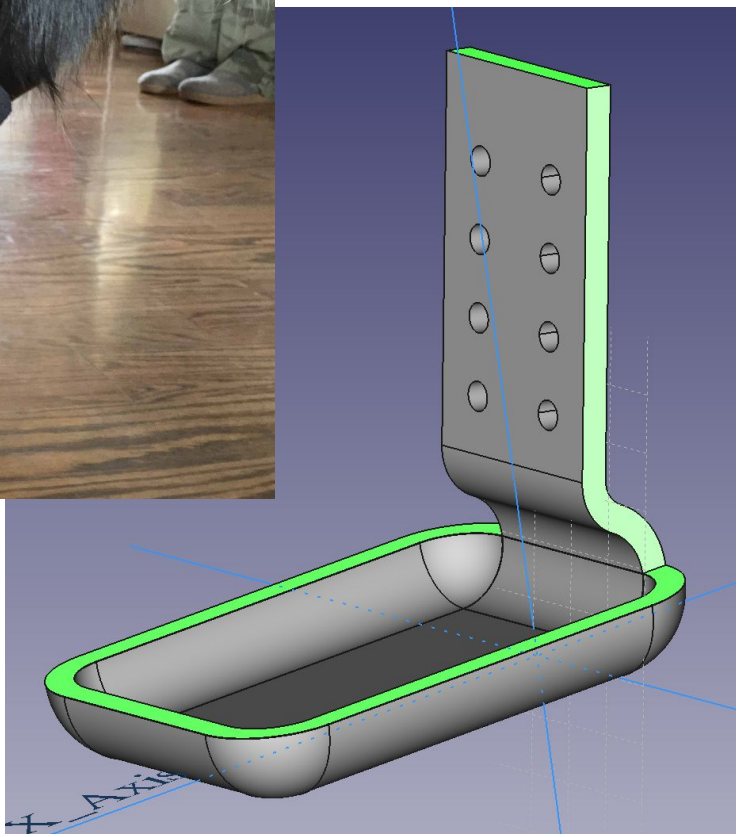
Stuff People Do



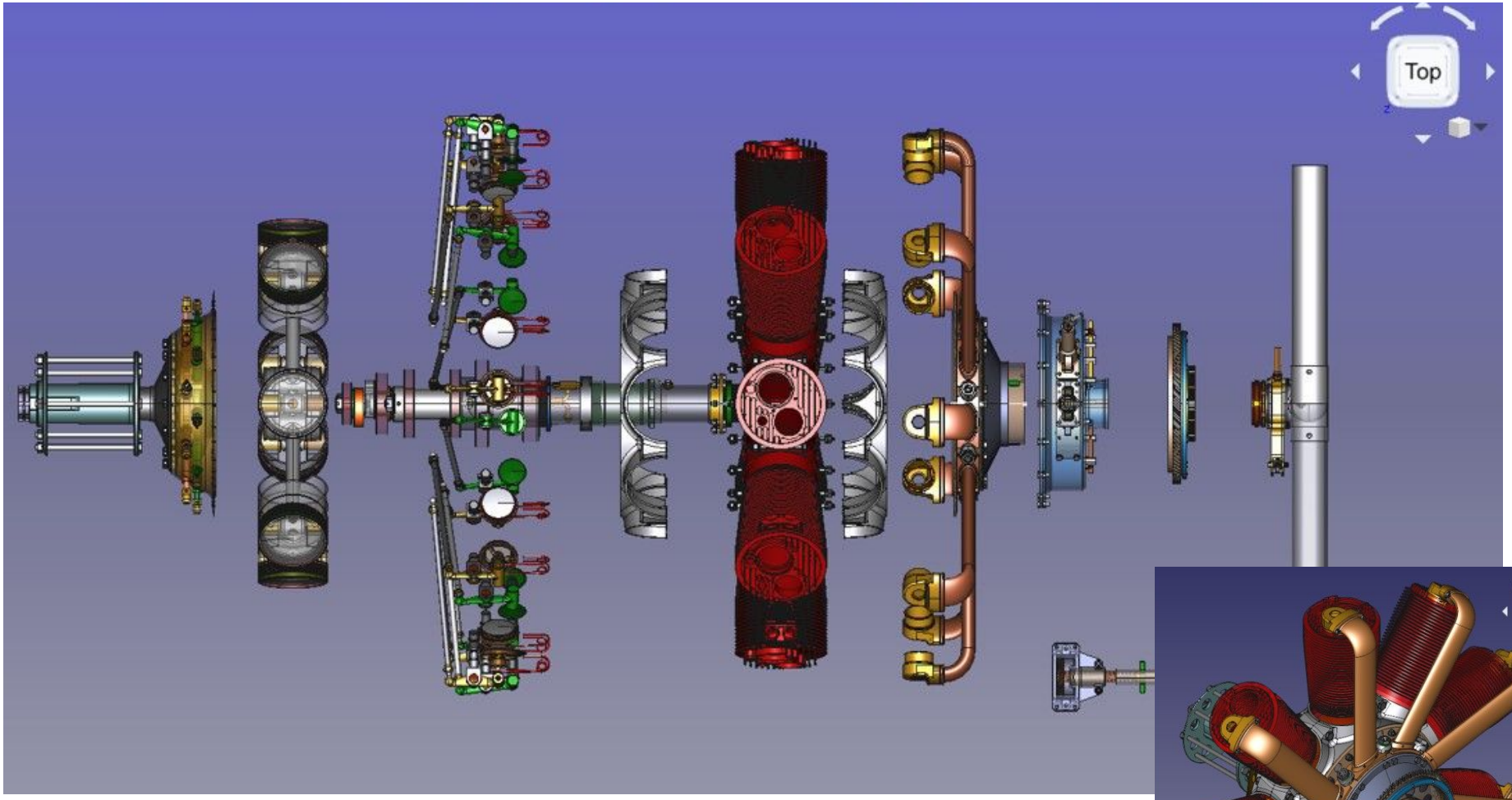
Images courtesy of user lemonbug

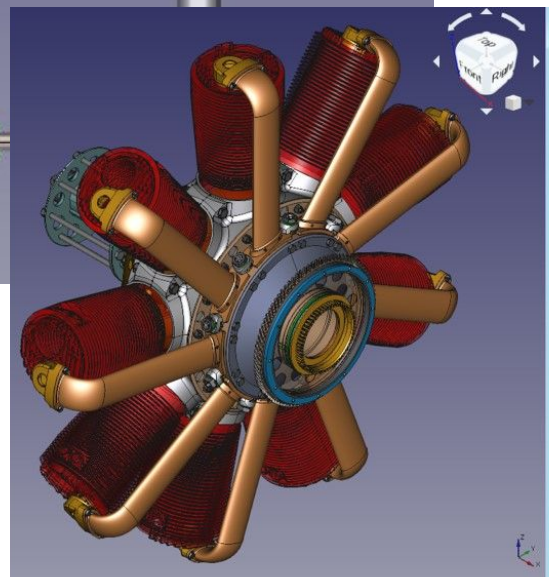


https://forum.freecadweb.org/viewtopic.php?f=24&t=26901&p=214854&hilit=dog#p214854

https://forum.freecadweb.org/viewtopic.php?f=3&t=29182&start=10

Stuff People Do





https://forum.freecadweb.org/viewtopic.php?f=24&t=29354

Images courtesy of
user ppweman

Structural Analysis

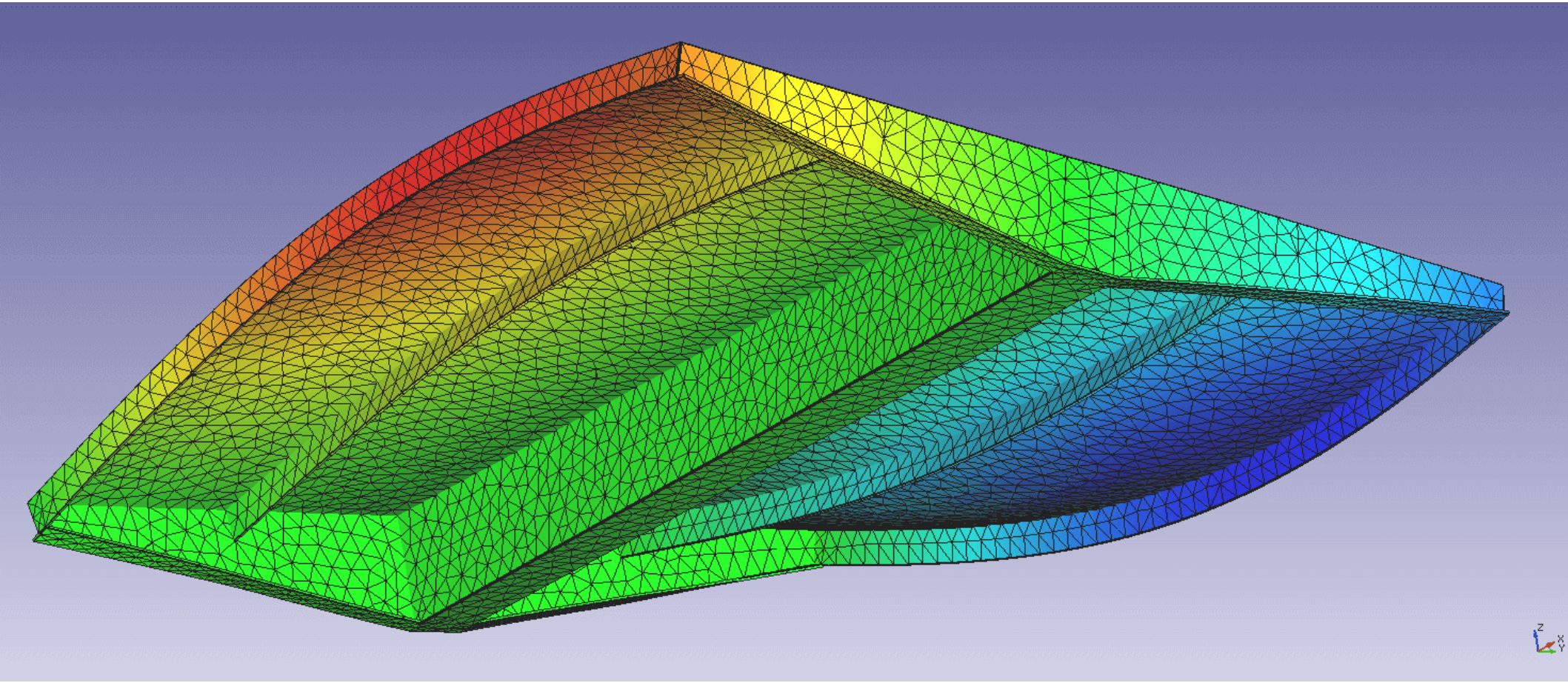
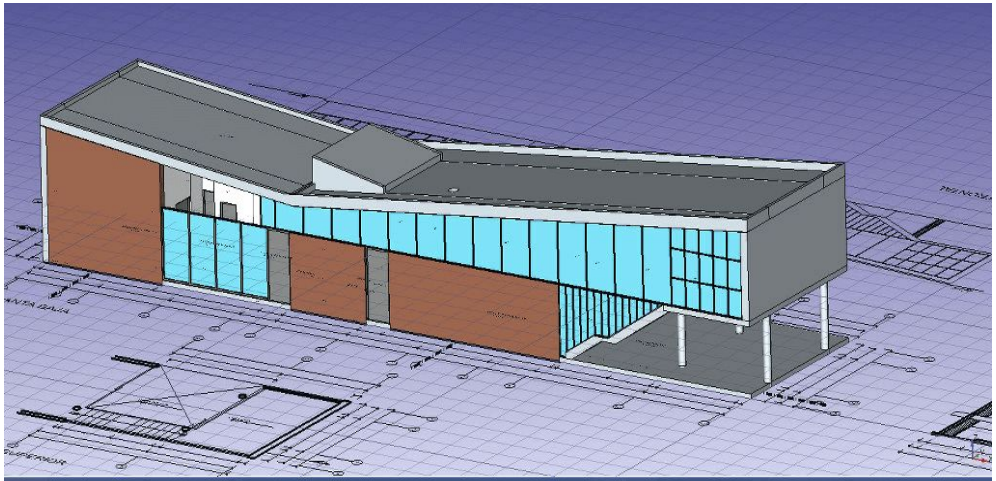


Image courtesy of user HarryvL

https://forum.freecadweb.org/viewtopic.php?f=18&t=27987&hilit=pedestrian&start=30

Architecture

- Yorik van Havre
  https://yorik.uncreated.net
- Building design using walls, windows, roof elements
- 2D plan visualization
- Bill of Materials
- BIM / IFC support
- Early 3D rendering support



WikiHouse

- Modular design
- Unskilled labor
- Standard, common materials
- Quick, simple construction
- 100% open source

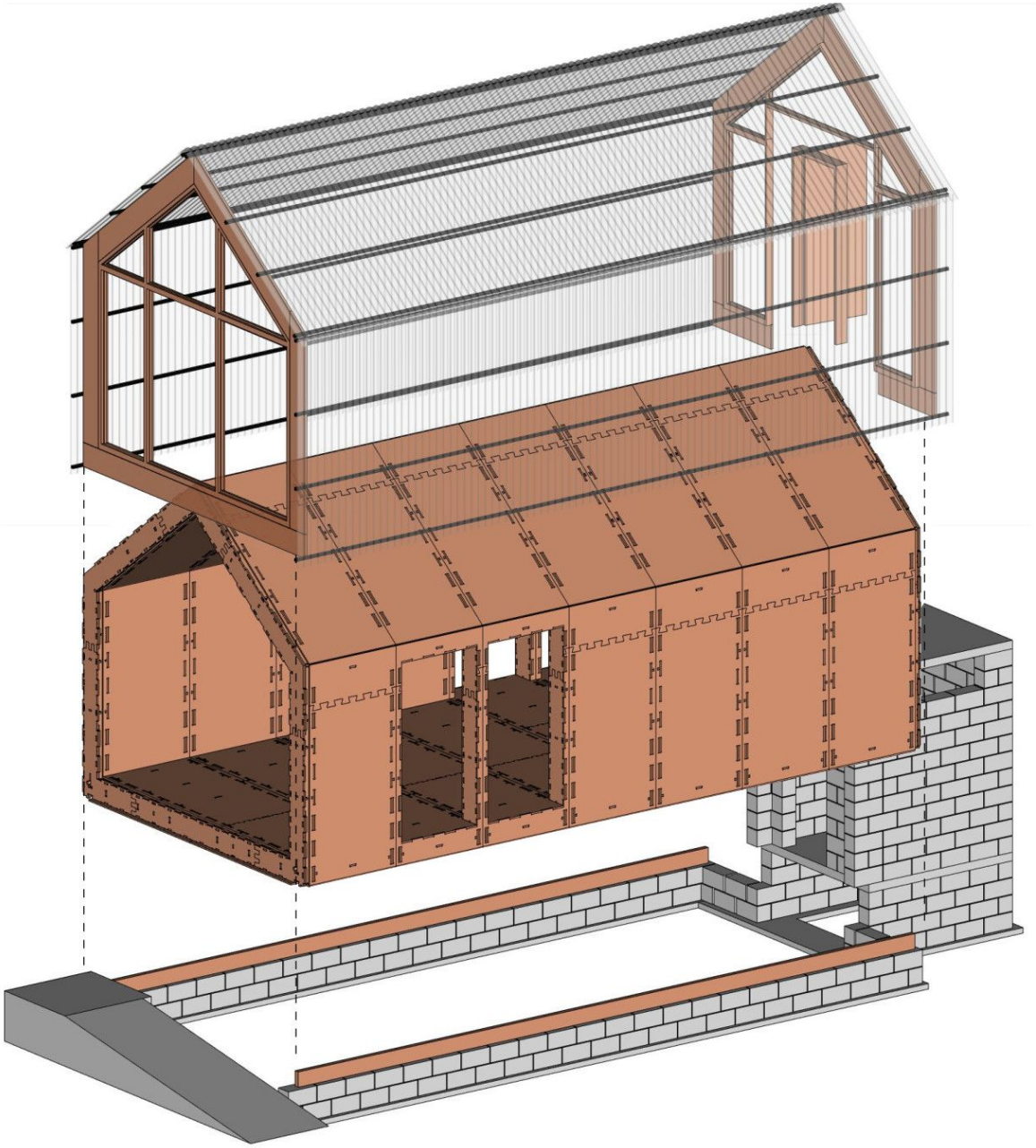


Image source:
https://github.com/uncreatednet/wikilab-ufabc/blob/master/english.md

WikiHouse

https://wikihouse.cc

Image source:
https://wikilab.blog.br/

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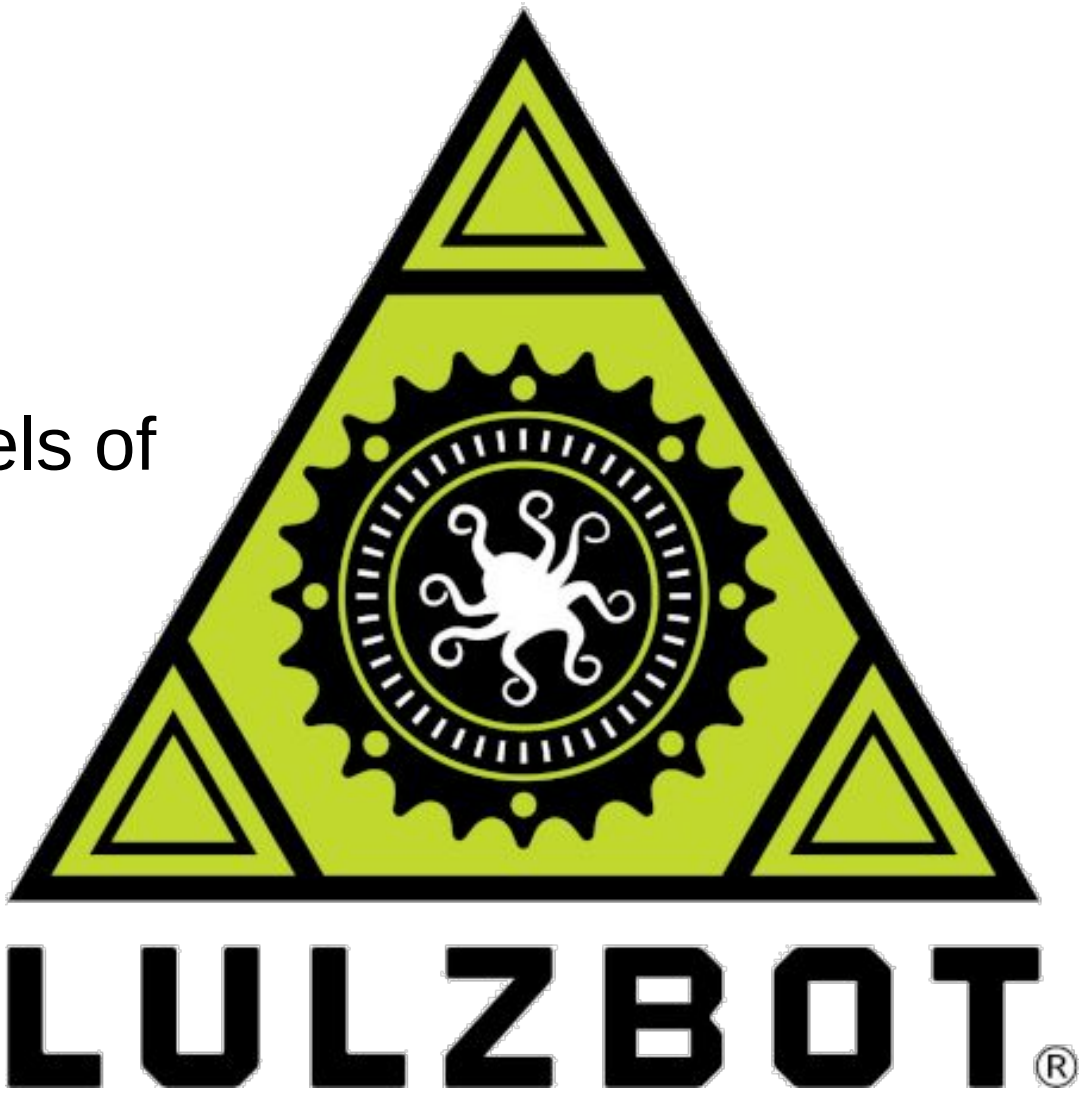
Lulzbot

- Open Source 3D Printer manufacturer
- Produces FreeCAD models of printer parts
- Has financially supported development



Open Source Ecology

- Marcin Jakubowski, Ph.D.
- 3D printer workshops
- Machines building machines
- Global Village Construction Set

➔ https://www.opensourceecology.org

➔ Follow on Facebook

Dr. Rufus Pollock

- Founder, Open Knowledge Foundation
- PhD (Cambridge University)
- Fellow
  - Shuttleworth Foundation
  - Cambridge University

Material Economics, Digital Economy

8 wealthiest people

½ the global wealth

“How Tech is Driving Inequality” - Dr. Rufus Pollock, video
https://www.youtube.com/watch?v=6V6x7jySLvc

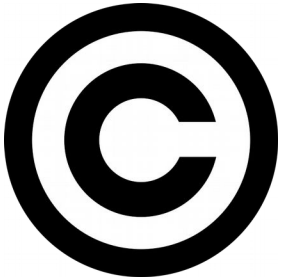
Image source: pixabay.com

Material Economics, Digital Economy

Platform Effect

Costless Copies

Intellectual Property



Dr. Rufus Pollock, Presentation - “Making an Open Information Age”
https://www.create.ac.uk/wp-content/uploads/2016/03/Pollock_Slides_Glasgow_March_2016.pdf

Vendor Lock-In Formula

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Engineering Today

Competence

- Schooling
- Licensure

Tools

- Business
- Software

Machine Learning

What do we do, when the tools are more competent than the engineer?

Image source: pixabay.com

Machine Learning

If…
we can't check
the math

Then…
we must
own the tools.

Image source: pixabay.com

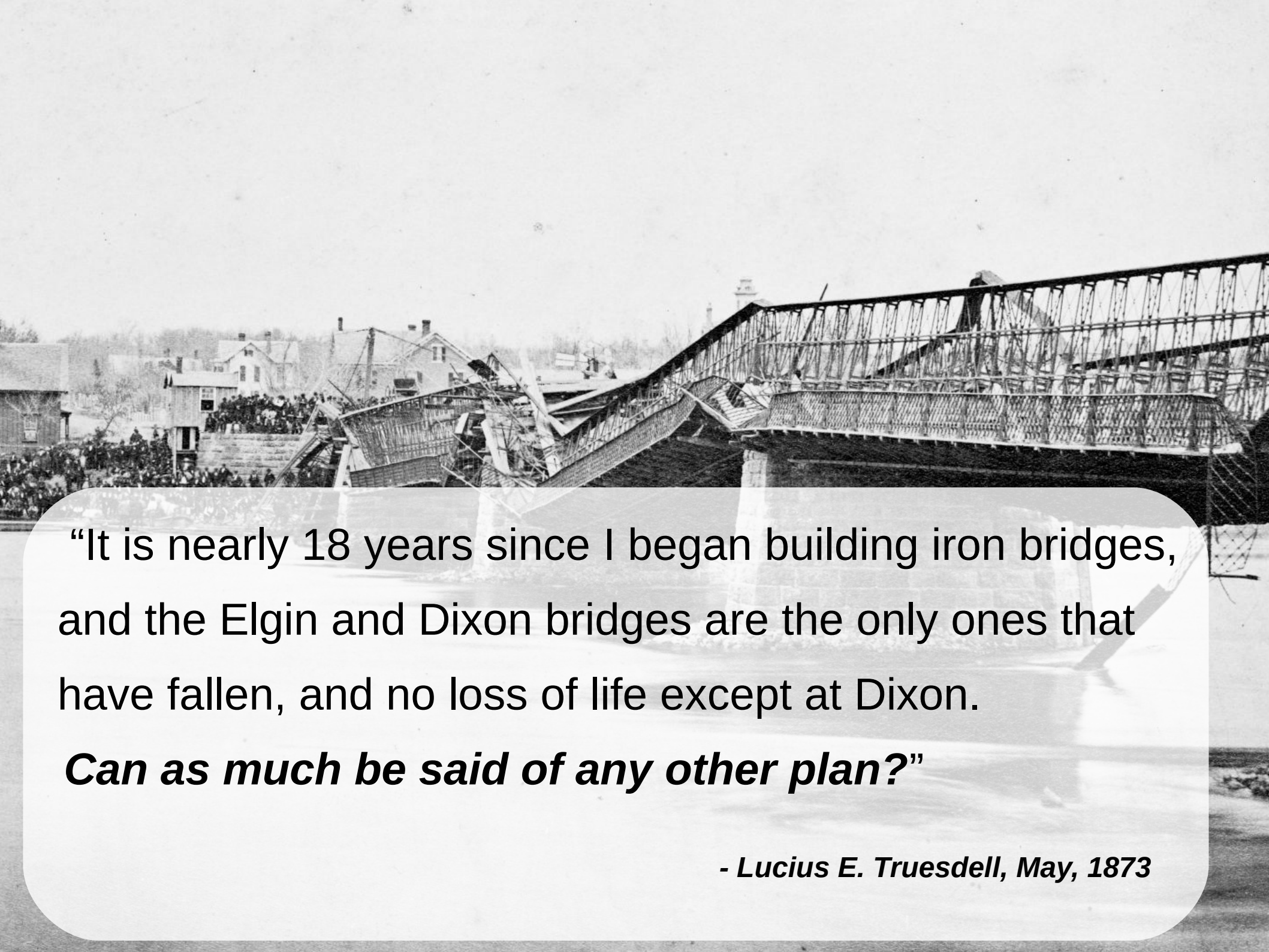
Sound engineering

should not require

exclusively licensing

someone's

intellectual property



"It is nearly 18 years since I began building iron bridges, and the Elgin and Dixon bridges are the only ones that have fallen, and no loss of life except at Dixon. ***Can as much be said of any other plan?***"

- Lucius E. Truesdell, May, 1873

The Cost of Lock-In

- Proprietary formats in government specifications
- Licensing creates obsolescence
- High costs restrict access to smaller agencies

Engineering the Future

- ✔ Governments must lead
- ✔ “Open Source First” policy
- ✔ GPL = transparency
- ✔ Subsidize open source

Image source: pixabay.com